



Appendices

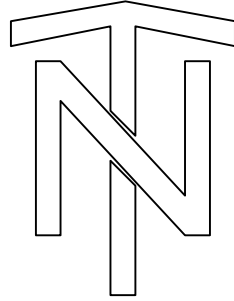
Appendix A – Indicative Masterplan





Appendix B - Topographical Survey

FILENAME : N:\COMMON FILES\GEOSPATIAL\LIVE PROJECTS\HCA - HARRAS MOOR, WHITEHAVEN\DELIVERABLES\A090070-410 - HARRAS MOOR, WHITEHAVEN\TOPOGRAPHICAL SURVEY.DWG | PLOTTED BY : RYAN CARRUTHERS | PLOTTED DATE : 24 November 2017 16:55:05



DO NOT SCALE: CONTRACTOR TO CHECK ALL DIMENSIONS AND REPORT ANY OMISSIONS OR ERRORS

SURVEY LEGEND			
AB	AIR BRICK	LP	LAMP POST
AV	AIR VALVE	MB	MOORING BOLLARD
BB	BELISHA BEACON	MCY	MACHINERY
BDY	BOUNDARY	MH	MANHOLE
BH	BOREHOLE	MKR	MARKER
BL	BED LEVEL	MP	MOORING PILE
BOL	BOLLARD	MBF	METAL RAILING FENCE
BRK	BRICKWORK	MS	MILE STONE
BS	BUS STOP	NP	STREET NAME PLATE
BM	BENCH MARK	NRA	NATIONAL RIVERS AUTHORITY
BW	BRICK WALL	OHE	OVERHEAD ELEC CABLE
BWF	BARBED WIRE FENCE	OHT	OVERHEAD TELE CABLE
CB	CONTROL BOX	OSR	OPEN STEEL RAILINGS
CF	CORRUGATED IRON FENCE	P	POST
CL	COVER LEVEL	PAL	PALLISADE FENCE
CLF	CHAIN LINK FENCE	PB	PILLAR BOX
CONC	CONCRETE	PO	POST
CP	CONCRETE POST	PRF	POST & RAIL FENCE
CTL	COPYING LEVEL	PTM	PARKING TICKET MACHINE
CR	CYCLE RACK	PWF	POST & WIRE FENCE
CTV	CABLE T.V. MANHOLE	RB	RIGHT BANK
CUL	CULVERT	RE	RODDING EYE
DK	DROP KERB	RS	ROAD SIGN
DL	DECK LEVEL	RTW	RETAINING WALL
DP	DOWNPIPE	RWP	RAINWATER PIPE
DPC	DAMP PROOF COURSE	SAP	TREE SAPPING
DRF	DRAIN	SB	SIGN BOARD
DWB	DOG WASTE BIN	SDP	STAND PIPE
EA	ENVIRONMENT AGENCY	SHLT	BUS SHELTER
EB	ELECTRICITY BOX	SL	SCAFFOLD LEVEL
ECF	ELECTRIC CABLE FENCE	SMP	SHEET METAL PILING
ECF	ELECTRICITY CABLE PIT	SP	SIGN POST
EMH	ELECTRICITY MANHOLE	STW	STAY WIRE
EP	ELECTRICITY POLE	SV	SUICE VALVE
ER	EASTING ROD	SV	SOIL VENT PIPE
ETL	ELECTRICITY TRANSMISSION LINE	SWF	SHEEP WIRE FENCE
FB	FLOWER BED	T BOL	TRAFFIC BOLLARD
FBR	FOOTBRIDGE	TCB/TCP	TELEPHONE CALL BOX/POST
FH	FIRE HYDRANT	TC	TELECOM CABINET
FHM	FIRE HYDRANT MARKER	TEL	TELECOM MANHOLE
FL	FLOOR LEVEL	THL	THRESHOLD LEVEL
FP	FENCE POST	TL	TRAFFIC LIGHT
FWM	FOUL WATER MANHOLE	TLB	TRAFFIC LIGHT BOX
G	GULLY	TP	TELEGRAPH POLE
GL	GROUND LEVEL	TRS	TIMBER RUBBERING STRIP
GP	GATE POST	TS	TREE STUMP
GM	GAS MANHOLE	VP	VERTICAL PIPE
GV	GAS VALVE	WB	WASTE BIN
HW	HEAD WALL	WL	WATER LEVEL/WATER LINE
IC	INSPECTION CHAMBER	WM	WATER METER
IL	INVERT LEVEL	WMF	WIRE MESH FENCE
IWF	IRON RAILING FENCE	WP	WOODEN POST
IWF	INTERWOVEN FENCE	WVP	WOODEN PANEL FENCE
JB	JUNCTION BOX	WV	WATER VALVE
KD	KERB GULLY	YG	YARD GULLY
LB	LEFT BANK		
LFB	LIFEBUOY		

(Abbreviations allow for survey data only)

SURVEY IS RELATED TO OS NATIONAL GRID VIA GNSS OBSERVATIONS

SCALE FACTOR: 0.99972771

ALL LEVELS RELATE TO GNSS DATUM

PLOT SCALE 1:1

REV	DESCRIPTION	BY	CHK	APP	DATE
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ARNDAL COURT
HEADINGLEY
LEEDS
LS6 2UJ

TEL: +44 (0)113 278 7111
FAX: +44 (0)113 275 0623



Project:
Harras Moor
Whitehaven

Drawing Title:
Topographical Survey

Scale @ 1:1	Drawn RSC	Date 24/11/17	Checked DMR	Date 24/11/17	Approved DMR	Date 24/11/17
Project No. A090070-410	Office 001	Type	Drawing No. A090070-410_T001	Revision 0		



Appendix C - United Utilities Sewer Records



United Utilities Water Limited

Property Searches
Ground Floor Grasmere House
Lingley Mere Business Park
Great Sankey
Warrington
WA5 3LP

Telephone 0370 751 0101

Property.searches@uuplc.co.uk

Your Ref: A090070-410 TOM BEAVIS
Our Ref: 1339463
Date: 8/11/2017

White Young Green

**Arndale Court
Headingley
Leeds
LS6 2UJ**

FAO:

Dear Sirs

Location: 6 WINDSOR TERRACE HARRAS MOOR WHITEHAVEN CA28 6SQ

I acknowledge with thanks your request dated 06/11/17 for information on the location of our services.

Please find enclosed plans showing the approximate position of our apparatus known to be in the vicinity of this site.

The enclosed plans are being provided to you subject to the United Utilities terms and conditions for both the wastewater and water distribution plans which are shown attached.

If you are planning works anywhere in the North West, please read our access statement before you start work to check how it will affect our network.

<http://www.unitedutilities.com/work-near-asset.aspx>.

I trust the above meets with your requirements and look forward to hearing from you should you need anything further.

If you have any queries regarding this matter please telephone us on 0370 7510101.

Yours Faithfully,

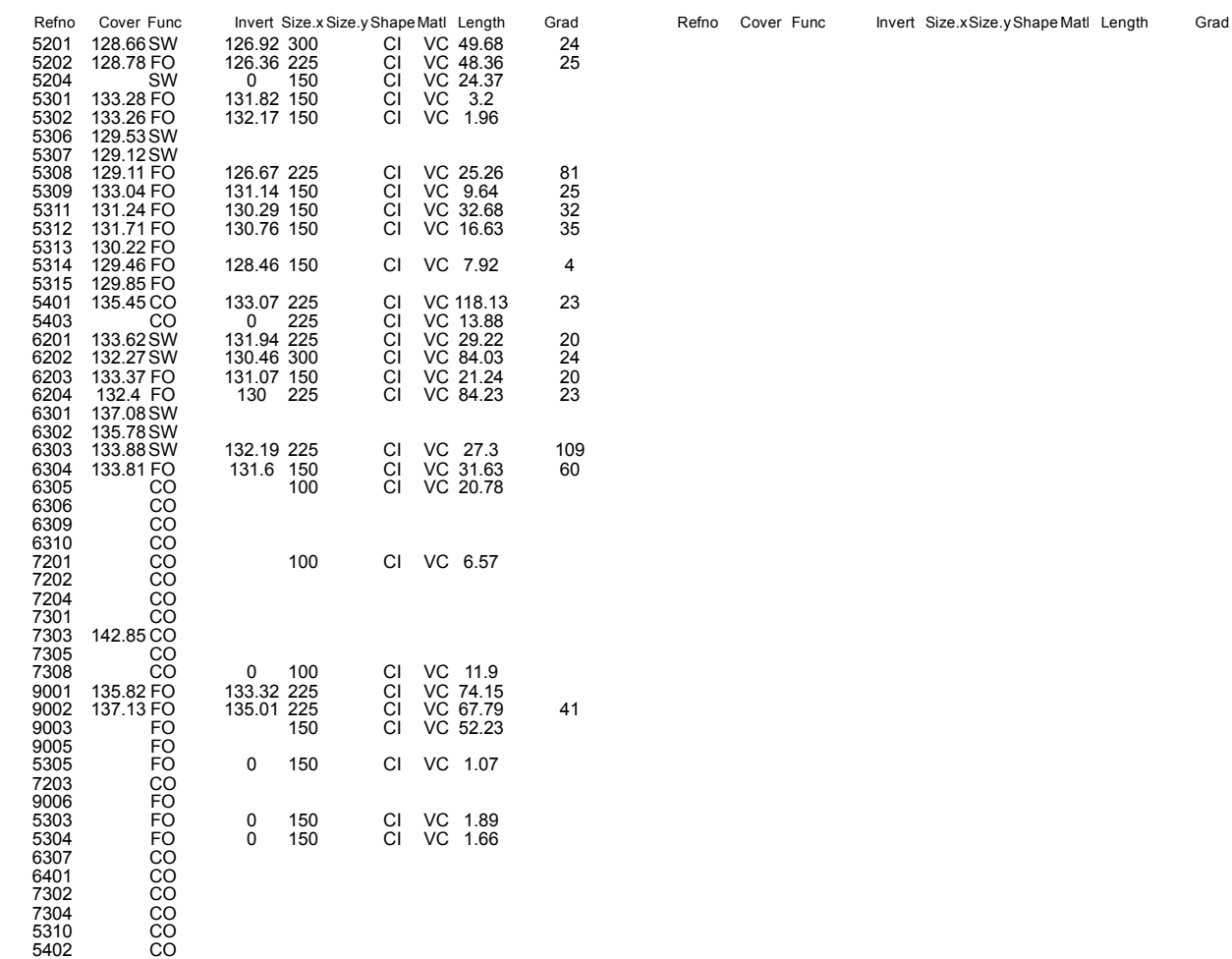
Karen McCormack
Property Searches Manager

TERMS AND CONDITIONS - WASTERWATER & WATER DISTRIBUTION PLANS

These provisions apply to the public sewerage, water distribution and telemetry systems (including sewers which are the subject of an agreement under Section 104 of the Water Industry Act 1991 and mains installed in accordance with the agreement for the self-construction of water mains) (UUWL apparatus) of United Utilities Water Limited "(UUWL)".

TERMS AND CONDITIONS:

1. This Map and any information supplied with it is issued subject to the provisions contained below, to the exclusion of all others and no party relies upon any representation, warranty, collateral contract or other assurance of any person (whether party to this agreement or not) that is not set out in this agreement or the documents referred to in it.
2. This Map and any information supplied with it is provided for general guidance only and no representation, undertaking or warranty as to its accuracy, completeness or being up to date is given or implied.
3. In particular, the position and depth of any UUWL apparatus shown on the Map are approximate only and given in accordance with the best information available. The nature of the relevant system and/or its actual position may be different from that shown on the plan and UUWL is not liable for any damage caused by incorrect information provided save as stated in section 199 of the Water Industry Act 1991. UUWL strongly recommends that a comprehensive survey is undertaken in addition to reviewing this Map to determine and ensure the precise location of any UUWL apparatus. The exact location, positions and depths should be obtained by excavation trial holes.
4. The location and position of private drains, private sewers and service pipes to properties are not normally shown on this Map but their presence must be anticipated and accounted for and you are strongly advised to carry out your own further enquiries and investigations in order to locate the same.
5. The position and depth of UUWL apparatus is subject to change and therefore this Map is issued subject to any removal or change in location of the same. The onus is entirely upon you to confirm whether any changes to the Map have been made subsequent to issue and prior to any works being carried out.
6. This Map and any information shown on it or provided with it must not be relied upon in the event of any development, construction or other works (including but not limited to any excavations) in the vicinity of UUWL apparatus or for the purpose of determining the suitability of a point of connection to the sewerage or other distribution systems.
7. No person or legal entity, including any company shall be relieved from any liability howsoever and whensoever arising for any damage caused to UUWL apparatus by reason of the actual position and/or depths of UUWL apparatus being different from those shown on the Map and any information supplied with it.
8. If any provision contained herein is or becomes legally invalid or unenforceable, it will be taken to be severed from the remaining provisions which shall be unaffected and continue in full force and affect.
9. This agreement shall be governed by English law and all parties submit to the exclusive jurisdiction of the English courts, save that nothing will prevent UUWL from bringing proceedings in any other competent jurisdiction, whether concurrently or otherwise.

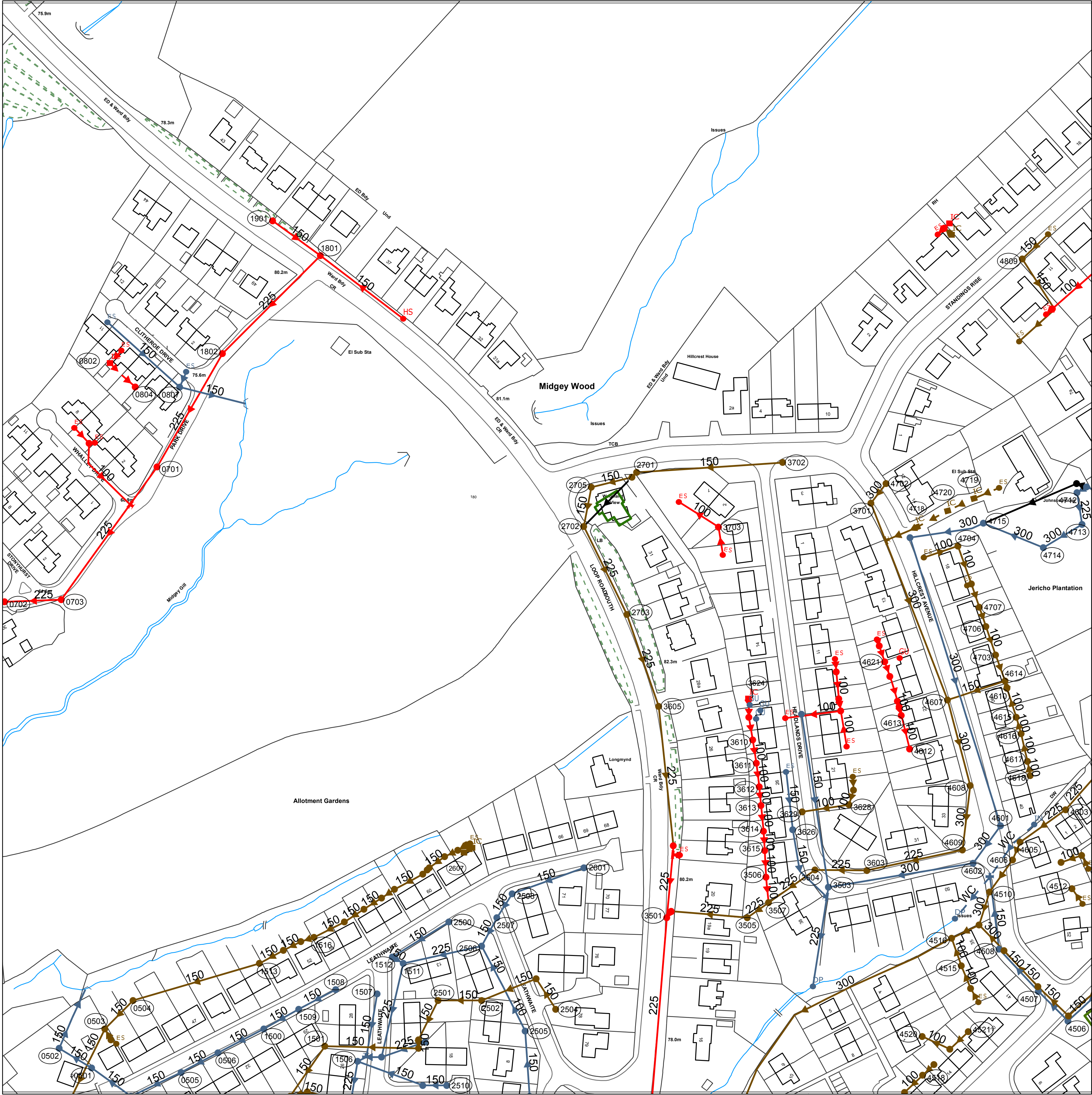


Foul	Surface	Combined		
			WW Site Termination	Sludge Main, Public
			Air Valve	Sludge Main, Private
			Cascade	Sludge Main, S104
			Non Return Valve	
			Extent of Survey	
			Flow Meter	
			Gully	
			Hatch Box	
			Head of System	
			Hydrobrake / Vortex	
			Inlet	
			Inspection Chamber	
			Bifurcation	
			Catchpit	
			Contaminated Surface Water	
			WW Pumping Station	
			Sludge Pumping Station	
			Sewer Overflow	
			T Junction/Saddle	
			LampHole	
			OilInterceptor	
			PenStock	
			Pump	
			RoddingEye	
			Soakaway	
			Summit	
			Valve	
			Valve Chamber	
			Washout Chamber	
			DropShaft	
			WW Treatment Works	
			Septic Tank	
			Vent Column	
			Network Storage Tank	
			Orifice Plate	
			Vortex Chamber	
			Penstock Chamber	
			Blind Manhole	
Foul	Surface	Combined	Overflow	
			Screen Chamber	Control Kiosk
			Discharge Point	
			Outlet	
				Unspecified

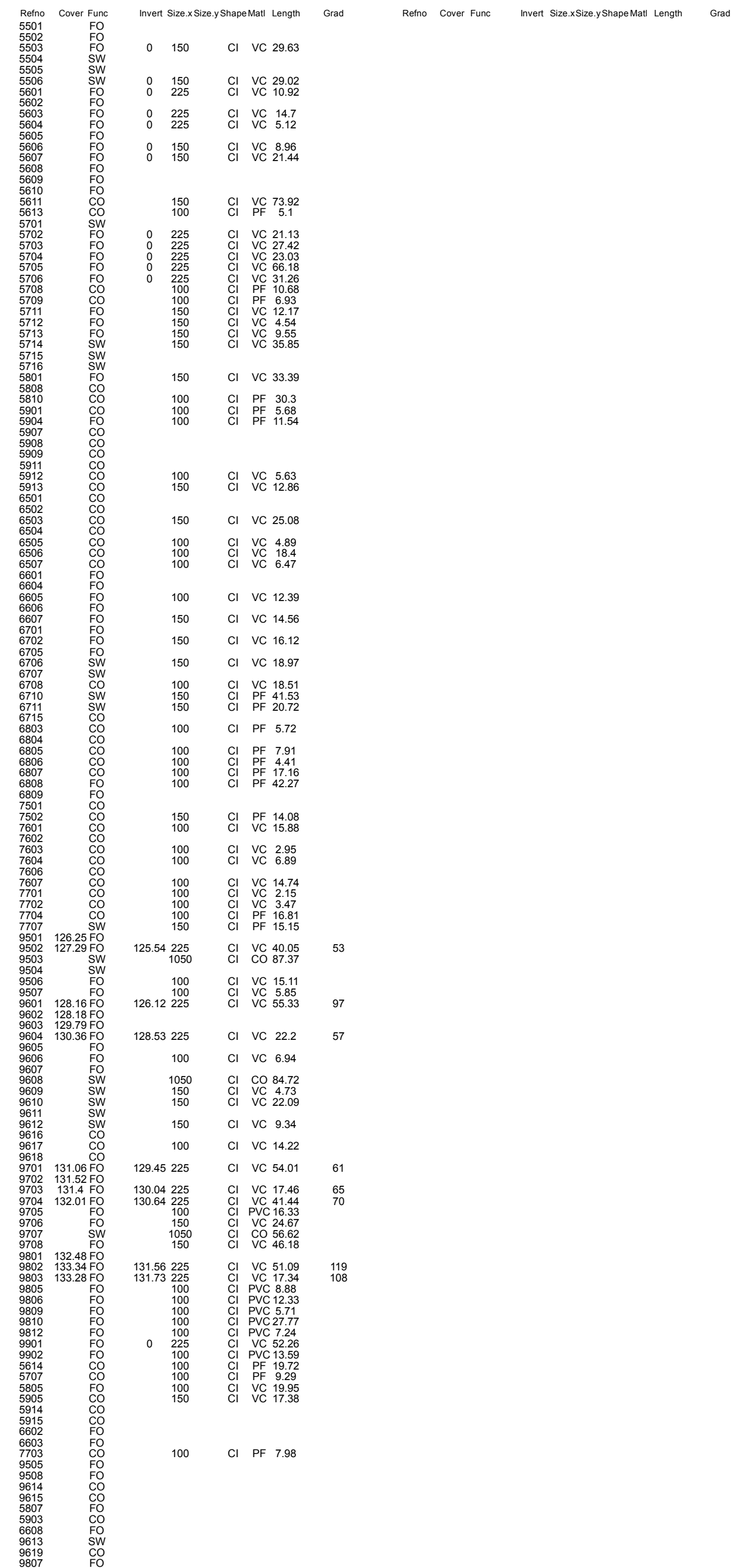
MANHOLE FUNCTION	
FO	Foul
SW	Surface Water
CO	Combined
OV	Overflow
SEWER SHAPE	
CI	Circular
TR	Trapezoidal
EG	Egg
AR	Arch
OV	Oval
BA	Barrel
FT	Flat Top
HO	HorseShoe
RE	Rectangular
UN	Unspecified
SEWER MATERIAL	
AC	Asbestos Cement
DI	Ductile Iron
BR	Brick
PVC	Polyvinyl Chloride
PE	Polyethylene
CI	Cast Iron
RP	Reinforced Plastic Matrix
SI	Spun Iron
CO	Concrete
ST	Steel
CSB	Concrete Segment Bolted
VC	Vitrified Clay
CSU	Concrete Segment Unbolted
PP	Polypropylene
CC	Concrete Box Culverted
PF	Pitch Fibre
PSC	Plastic/Steel Composite
MAC	Masonry, Coursed
GRC	Glass Reinforced Concrete
MAR	Masonry, Random
GRP	Glass Reinforced Plastic
U	Unspecified

SEWER RECORDS

Printed By: Property Searches



Reho	Cover	Func	Invert	Size	Size	yShape	Mat	Length	Grad	Reho	Cover	Func	Invert	Size	Size	yShape	Mat	Length	Grad	
0501	48.12	SW	47.07	150		CI	VC	17.49		4809	FO									
0502		SW								4810	FO									
0503		FO	0	150		CI	VC	52.33		0508	SW									
0504	49.5	FO	53.51	150		CI	VC	25.5	8	0803	CO		100		CI	VC	8.2			
0505	54.27	SW								1504	CO		150		CI	VC	47.8			
0506	56.17	SW								2509	SW									
0510	11.7	FO								3608	SW									
0701	71.3	CO	70.28	225		CI	VC	75.21		3622	SW									
0702	57.57	CO	0	225		CI	VC	26.02		3623	CO									
0703		CO								3625	CO									
0704		CO	100			CI	VC	36.14		4619	FO		100		CI	PF	9.05			
0802		CO								4626	FO									
0804		CO								4721	CO									
0807		SW								4808	FO									
1500	58.87	SW	58.11	150		CI	VC	23.71	9	4808	FO		150		CI	VC	22.14			
1501	70.42	FO				CI	VC	28.02		0706	CO									
1502		FO	0	150		CI	VC	43.01		1521	SW									
1503		FO	0	150		CI	VC	4		3508	SW									
1504		SW	0	225		CI	VC	21.19		3607	CO									
1505		SW								4722	FO									
1506	63.37	SW	62.18	225		CI	VC	18.25	34	4509	SW									
1507	66.1	SW	65.15	150		CI	VC	29.43		2706	FO									
1508	64.08	SW	63.04	150		CI	VC	19.24		4711	SW									
1509	61.44	SW	60.52	150		CI	VC	18.36	7											
1510	67.19	SW	66.42	150		CI	VC	31.96	8											
1511		SW	0	225		CI	VC	44.15	8											
1512	68.48	SW	0	150		CI	VC	5.83												
1513		FO	0	150		CI	VC	60.44												
1514		FO	0	150		CI	VC	12.53												
1515	63.74	FO	62.68	150		CI	VC	8.84												
1516	65.04	FO	63.87	150		CI	VC	6.32	5											
1517	66.16	FO	65.17	150		CI	VC	15.65	13											
1518		FO	0	150		CI	VC	10.82												
1519	68.27	FO	67.19	150		CI	VC	9.43												
1520	70.14	FO	0	150		CI	VC	7.21												
1522		FO																		
1601		FO	0	150		CI	VC	2.83												
1602	70.42	FO	69.81	150		CI	VC	1.41												
1603	70.42	FO	69.48	150		CI	VC	14.76												
1801	80.31	CO																		
1902			0	225		CI	VC	60.03												
1901	79.93	CO	79.17	150		CI	VC	27.2	124											
2500	70.96	SW	70	150		CI	VC	30.53												
2501	69.11	FO	67.81	150		CI	VC	20.12	13											
2502	71.33	FO																		
2503	73.64	FO																		
2504	74.24	FO																		
2505	73.19	SW																		
2506	71.46	SW																		
2507	72.77	SW																		
2508		SW																		
2510	69.04	SW	68.34	150		CI	VC	11	6											
2601	77.95	SW	76.26	150		CI	VC	35.11												
2604		FO	0	150		CI	VC	8.6												
2604		FO	0	100		CI	VC	4.67												
2605		FO	100																	
2606		FO	100																	
2607		FO																		
2702	14.58	FO	13.58	150		CI	VC	3.07	9											
2702	10	FO	9.25	225		CI	VC	45.1												
2703																				
2704	14.6	FO	13.23	150		CI	VC	19.16	7											
2705	11.7	FO																		
3501	79.58	CO	77.57	225		CI	VC	170.58	47											
3502	79.63	CO	78.76	225		CI	VC	3.61	5											
3503		SW																		
3505		CO																		
3506		CO																		
3601		CO	0	225		CI	PF	11.82												
3607		CO	0	225		CI	VC	11.93												
3602		SW	0	150		CI	VC	80.4												
3603		CO	0	225		CI	VC	23.75												
3604		FO	0	225		CI	VC	28.14												
3605		CO	100			CI	PF	10.42												
3610		CO																		
3611		CO																		
3612		CO																		
3613		CO																		
3614		CO																		
3615		CO	100			CI	PF	12.13												
3617		CO																		
3618		CO																		
3619		CO																		
3624		CO																		
3626		SW	150			CI	PF	36.47												
3628		FO																		
3629		FO																		
3630		FO	0	100		CI	VC	7.06												
3701		FO	0	300		CI	VC	97.02												
3702		FO	0	150		CI	VC	67.25												
3703		FO	0	100		CI	VC	21.47												
4501		FO	0	150		CI	VC	18.44												
4502		FO																		
4503		FO																		
4504		SW																		
4507		SW	0	150		CI	VC	33.48												
4508		SW	0	300		CI	VC	15.91												
4510		FO																		
4514		FO	100			CI	PF	11.2												
4515		FO	100			CI	PF	13.46												
4516		FO																		
4517		FO	100			CI	PF	7.09												
4518		FO	100			CI	PF	11.35												
4519		FO	100			CI	VC	14.01												
4520		FO																		
4521		FO	0	100		CI	VC	11.68												
4601		SW	0	300		CI	VC	21.37												
4602		SW																		
4603		FO	0	225		CI	VC	25.71												
4605		FO	0	225		CI	VC	8.88												
4606		FO	0	300		CI	VC	18.04												
4607		FO	0	300		CI	VC	40.65												
4608		FO	0	300																



Foul	Surface	Combined		
			WW Site Termination	Sludge Main, Public
			Air Valve	Sludge Main, Private
			Cascade	Sludge Main, S104
			Non Return Valve	
			Extent of Survey	ABANDONED PIPE
			Flow Meter	MainSewer
			Gully	Rising Main
			Hatch Box	Highway Drain
			Head of System	Sludge Main
			Hydrobrake / Vortex	
			Inlet	
			Inspection Chamber	
			Bifurcation	
			Catchpit	
			Contaminated Surface Water	
			WW Pumping Station	
			Sludge Pumping Station	
			Sewer Overflow	
			T Junction/Saddle	
			LampHole	
			OilInterceptor	
			PenStock	
			Pump	
			RoddingEye	
			Soakaway	
			Summit	
			Valve	
			Valve Chamber	
			Washout Chamber	
			DropShaft	
			WW Treatment Works	
			Septic Tank	
			Vent Column	
			Network Storage Tank	
			Orifice Plate	
			Vortex Chamber	
			Penstock Chamber	
			Blind Manhole	
			Screen Chamber	Control Kiosk
			Discharge Point	Unspecified
			Outfall	

MANHOLE FUNCTION	
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SEWER SHAPE			
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RE	Rectangular	UN	Unspecified
SQ	Square		

AC	Asbestos Cement	DI	Ductile Iron
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PE	Polyethylene	CI	Cast Iron
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CB	Concrete Box Culverted	PF	Pitch Fibre
PSC	Plastic/Steel Composite	MAC	Masonry, Coursed
GRC	Glass Reinforced Concrete	MAR	Masonry, Random
GRP	Glass Reinforced Plastic	U	Unspecified

OS Sheet No: NX9817NE
Scale: 1:1250 Date: 08/11/2017
141 Nodes
Sheet 1 of 1



Scale: 1:1250 Date: 08/11/2017

Printed By: Property Searches



**Appendix D - Correspondence with Cumbria County Council and
Copeland Borough Council**

From: Robinson, Michael D <Michael.Robinson2@cumbria.gov.uk>

Sent: 23 February 2021 09:01

To: AguilarFuertes, Francisco <F.AGUILARFUERTES@tetrattech.com>

Subject: RE: 4/18/2287/001 - Harras Moor - Whitehaven - Revised FRA - [Filed 23 Feb 2021 09:05]

Morning Francisco,

The information supplied is acceptable.

Regards

Michael

Michael Robinson

Flood & Development Management Officer | Flood & Development Management
Economy & Environment | Cumbria County Council |
Parkhouse Building | Baron Way | Carlisle | CA6 4SJ

Mob: 07768141019

www.cumbria.gov.uk

Please be aware that I work flexible hours, so whilst this is a convenient time for me to send this email to you, I do not expect a response from you outside your normal working hours.

<http://www.cumbriastrategicfloodpartnership.org/index.html>



From: AguilarFuertes, Francisco <F.AGUILARFUERTES@tetrattech.com>

Sent: 15 February 2021 15:46

To: Robinson, Michael D <Michael.Robinson2@cumbria.gov.uk>

Subject: RE: 4/18/2287/001 - Harras Moor - Whitehaven - Revised FRA -

Dear Michael,

I was wondering if you have had a chance to review my email below?

As you are aware the application has been awaiting determination for a long time and we would like to provide the revised information by the end of this month if possible so it can go back to committee in the next couple of months.

Thank you

Regards

Francisco de Borja Aguilar
Flood Risk & Drainage Engineer

Tetra Tech

3 Sovereign Square, Sovereign Street, Leeds, West Yorkshire, LS1 4ER
Tel: +44 113 219 7192

tetratecheurope.com

Tetra Tech Limited. Registered in England number: 1959704
Registered Office: 3 Sovereign Square, Sovereign Street, Leeds LS1 4ER VAT No: 431-0326-08.

www.tetratecheurope.com

Tetra Tech Limited. Registered in England number: 1959704 Registered Office: 3 Sovereign Square, Sovereign Street,
Leeds LS1 4ER VAT No: 431-0326-08.



From: AguilarFuertes, Francisco

Sent: 03 February 2021 08:16

To: Robinson, Michael D <Michael.Robinson2@cumbria.gov.uk>

Subject: RE: 4/18/2287/001 - Harras Moor - Whitehaven - Revised FRA - [Filed 03 Feb 2021 08:16]

Hi Michael,

Thanks for getting back to me.

I attach the latest version of the illustrative masterplan; however it is important to note that the contours are the main constraint when determining the drainage catchments within the site, and these will remain largely unchanged; and this is shown in SK003 that I previously provided but I attach again for convenience.

We have not undertaken a detail analysis of the flows entering the culverted watercourse; but only a high-level one; and this was included in the FRA we last submitted to the planning portal a couple of years ago, alongside drawing SK007 which I also attach for convenience. This stated: *The catchment area drained by the watercourse upstream of Caldbeck Road is approximately 16.6 ha and consists mainly of urban areas. It can be seen in SK007 in Appendix K that part of the site is within the catchment of Bedlam Gill. The culvert gradient is approximately 1/30 and at full capacity it can convey a flow of 4.86 m³/s. Based on a figure of 140 l/s/ha, the runoff rate from the upstream urban catchment is 2.33 m³/s.*

Regards

Francisco de Borja Aguilar
Flood Risk & Drainage Engineer

Tetra Tech

3 Sovereign Square, Sovereign Street, Leeds, West Yorkshire, LS1 4ER
Tel: +44 113 219 2284

www.tetratecheurope.com



TETRA TECH



From: Robinson, Michael D <Michael.Robinson2@cumbria.gov.uk>

Sent: 02 February 2021 11:43

To: AguilarFuertes, Francisco <F.AGUILARFUERTES@tetrattech.com>

Subject: RE: 4/18/2287/001 - Harras Moor - Whitehaven - Revised FRA -

Morning Francisco

Thank you for the supplied documents, a couple of questions

1. Do you have a concept plan of the highway and layout in line with the changes to the drainage proposed so we can get an understanding and reference possible impermeable areas.
2. The Eastern SW drainage connecting into the 1050mm pipe, do you have network analysis of the flows coming into the system above your intended connection point?

Regards

Michael

Michael Robinson

Flood & Development Management Officer | Flood & Development Management
Economy & Environment | Cumbria County Council |
Parkhouse Building | Baron Way | Carlisle | CA6 4SJ

Mob: 07768141019

www.cumbria.gov.uk

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<http://www.cumbriastrategicfloodpartnership.org/index.html>



From: AguilarFuertes, Francisco <F.AGUILARFUERTES@tetrattech.com>

Sent: 22 January 2021 16:24

To: Robinson, Michael D <Michael.Robinson2@cumbria.gov.uk>

Subject: 4/18/2287/001 - Harras Moor - Whitehaven - Revised FRA -

Dear Michael,

I hope you are keeping well.

You will recall that we discussed this site some time ago.

As you can see in the attached drawing (that we previously provided) and as we discussed during our call, we are proposing to divide the site into two drainage catchments; with the eastern part of the site draining to the culverted section of Bedlam Gill, and the west draining through the culverted watercourse that crosses the A595 and drains to Midgey Gill.

We are in the process of updating the FRA to reflect the above, as the proposals that were previously submitted to planning (and that Cumbria CC as LLFA accepted) included a discharge to Midgey Gill through third party land.

The accepted proposals included the restriction of flows into Bedlam Gill to 42 l/s. This is the Qbar rate from the part of the site that is currently within the Bedlam Gill catchment. We do not propose to amend the rates from the western catchment as these drains into a smaller pipe.

However, in order to aid the financial deliverability of the site, we would like to review the discharge rates into Bedlam Gill as shown below. These would be restricted by a complex flow control comprising a hydrobrake with a higher level orifice that can be designed at the reserved matters stage. Our estimate is that, based on sewer records and contours, the capacity of the Bedlam Gill culvert is 4.86 m³/s. The area of the site that currently falls within Bedlam Gill is 4.4ha, and the discharge from the site into the Bedlam Gill culvert will be restricted to the greenfield rates from these area.

The area of the site that currently falls within Bedlam Gill is 4.4ha. The greenfield rates from this area are shown in the table below.

Status	1 in 1 year	Qbar (l/s/ha)	1 in 30 year	1 in 100 year	1 in 100 year + 40 % CC
Greenfield (l/s)	111.2	8.4	217.2	265.8	N/A
Maximum Post Development Eastern Part (to Bedlam Gill) (l/s)	34.1		66.7	81.6	81.6
Post Development Western Part (to Midgey Gill) (l/s)	73.9		73.9	73.9	73.9

I would welcome your comments on our proposals before a revised FRA is submitted to the planning portal.

Thank you,

Regards

Francisco de Borja Aguilar
Flood Risk & Drainage Engineer

Tetra Tech

3 Sovereign Square, Sovereign Street, Leeds, West Yorkshire, LS1 4ER
Tel: +44 113 219 2284

www.tetratecheurope.com

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oliver.chard

From: francisco.aguilar
Sent: 22 May 2018 13:53
To: oliver.chard
Subject: FW: Ordinary Watercourses in Whitehaven
Attachments: ENQ215 Plan marked with Watercourse Routes.pdf

Francisco Aguilar
Flood Risk & Drainage Engineer

For more information about WYG Engineering, please have a look at our [brochure](#)

WYG
Arndale Court, Headingley, Leeds, West Yorkshire, LS6 2UJ
Tel: +44 113 219 2284

www.wyg.com

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Registered Office: Arndale Court, Otley Road, Headingley, Leeds, West Yorkshire LS6 2UJ VAT No: 431-0326-08.



From: LFRM Consent <LFRM.consent@cumbria.gov.uk>
Sent: 09 November 2017 11:00
To: francisco.aguilar <francisco.aguilar@wyg.com>
Subject: RE: Ordinary Watercourses in Whitehaven

Hello Francisco,

For your reference I have marked on the attached plan the sections which are Main River (Blue) and Ordinary Watercourses (Pink).

There are no additional local regulations to the Land Drainage Act 1991.

I hope the above comments are of assistance to you.

regards

A handwritten signature in blue ink that reads 'James Moultrie'.

James Moultrie

Assistant Development Management Officer
Flood & Development Management
Environment & Regulatory Services | Cumbria County Council
Parkhouse Building| Baron Way | Carlisle | CA6 4SJ

t: 01946 506550
Mb: 07766363360
w: www.cumbria.gov.uk

www.gov.uk/floodsdestroy

DO YOU KNOW WHAT TO DO?



From: francisco.aguilar [<mailto:francisco.aguilar@wyg.com>]

Sent: 07 November 2017 15:14

To: LFRM Consent

Cc: Beavis, Tom

Subject: Ordinary Watercourses in Whitehaven

Dear Colleague,

We have been commissioned to undertake a flood risk assessment in support of the planning application for the development of up to 450 dwellings in Harras Moor, Whitehaven. The nearest postcode is CA28 6SY and a plan showing the site boundary is attached for convenience.

There are a number of watercourses within the site boundary, as you can see in the extract of an OS map. Only Midgey Gill is shown as Main River in the EA's Flood Map for Planning. Therefore, we were seeking confirmation of the status of the rest of the watercourses by Cumbria CC as LLFA. If they were classified as 'ordinary watercourses', is there any local regulations that apply in addition to the Land Drainage Act 1991?

Thank you for your help

Regards

Francisco Aguilar
Flood Risk & Drainage Engineer

For more information about WYG Engineering, please have a look at our [brochure](#)

WYG

Arndale Court, Headingley, Leeds, West Yorkshire, LS6 2UJ

Tel: +44 113 219 2284

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From: David Bechelli <David.Bechelli@copeland.gov.uk>
Sent: 10 November 2017 09:20
To: francisco.aguilar
Cc: tom.beavis
Subject: RE: Proposed Developments in Whitehaven

Hi Francisco,

With regards to your request for information, I can provide you some information, but also have a couple of questions.

I'll bullet point them for ease as follows:

- In my opinion the non-main river reaches are ordinary watercourse, but where does the designation originate from?
- I am not aware of any local bye laws being supplemented by Copeland Borough Council – this is possible a question for our legal team.
- The critical drainage areas have been defined by the Lead Local Flood Authority, so they would provide any discharge limits.
- However, I think the critical drainage areas have been defined to address wider water management issues than just discharge rates.
- Ultimately if surface water is to be discharged into Midgey Gill, I would assume the Environment Agency would want to have some comments on this.
- You should be aware that the Environment Agency detailed river network maps contain inaccuracies.
- With regards to the site and watercourse, a ditch has been created on the part of the land upslope from High Grove.
- This discharges into the upper sections (ordinary watercourse) of Midgey Gill.
- This was to intercept surface flows, but properties down slope still have problems with surface water and groundwater in sub floor areas.
- This ditch also intercepts some old land tiles.
- Off site to the site is another main river, Snebra Beck.
- The upstream, ordinary watercourse (known as Bedlam Beck?) section is shown as issuing to the south of Carlton Drive.
- Old plans show that upstream from this the watercourse was culverted.
- The culvert possibly originates in the playing field or industrial area of the land in question.
- I also understand that the culvert is at a significant depth.
- With regards to flooding in the area, a number of properties on Red Lonning were recently flooded.
- The Lead Local Flood Authority has yet to publish its Section 19 report.
- I don't have specific details of any other actual property flooding near to the site, but there have been numerous historic and continuing drainage and flooding issues in the area.
- This includes, but is not limited to Loop Road South (surface water and/or culvert on the land in question) and areas of the Hillcrest and Red Lonning estates immediately adjacent to and downstream of the site.
- With regards to the retail units, the only recent flooding recorded in the vicinity that I am aware of is cellar flooding.
- Historic tidal flooding was a frequent problem until the tidal lock was constructed at Whitehaven Harbour about 1997/1998.

In general the land to the east of Whitehaven is steep, with shallow top soil on clay. This leads to rapid saturation with flows both above and below surface causing problems downslope. Any flood risk assessment need to take this into account and develop a strategy to deal with these flows, to both protect any proposed development and existing development.

If you have any questions or would like further information, please do not hesitate to contact me.

Regards

Dave

David Bechelli

Flood and Coastal Defence Engineer
Environmental Health
Copeland Borough Council

Tel: 01946 593048

Fax: 01946 592525

E-mail: David.Bechelli@copeland.gov.uk

Copeland Borough Council, Whitehaven Commercial Park, Moresby Parks, Moresby, Whitehaven, Cumbria, CA28 8YD. Tel: 01946 598300. Fax: 01946 598303. www.copeland.gov.uk, info@copeland.gov.uk



From: francisco.aguilar [mailto:francisco.aguilar@wyg.com]

Sent: 09 November 2017 10:32

To: David Bechelli <David.Bechelli@copeland.gov.uk>

Cc: tom.beavis <tom.beavis@wyg.com>

Subject: Proposed Developments in Whitehaven

Dear David,

We have been commissioned to prepare 2 flood risk assessments in Whitehaven and we would be grateful if you could provide information regarding the sites.

The first site is a 15ha greenfield site in Harras Moor, a site plan is attached for convenience.

There are a number of watercourses within the site, with only a reach of Midgley Gill being classified as a main river. Could you indicate if the non – main river reaches are classified as ordinary watercourses? If so, has Copeland DC enabled any local bye laws in addition to the Land Drainage Act to regulate the watercourses?

I note that the draft SWMP indicates that Whitehaven is within a Critical Drainage Area and Harras Moor is in the upper part of the catchment. Therefore I was wondering if there are any discharge limit requirements due to the CDA or if limiting rates to the Qbar rate will be acceptable.

Finally, could you indicate if Copeland DC has any records of flooding near this site?

The second site is the existing retail (Argos) unit in the junction between Quay St and Swingpump Ln in Whitehaven. A plan is also attached for convenience.

This is a brownfield site and surface water runoff discharges to the existing UU combined sewer in Quay St. Again, as the site is in a CDA, are there any discharge requirements that we should be aware of? Are there any records of flooding near the site?

Thank you very much for your help

Regards

Francisco Aguilar
Flood Risk & Drainage Engineer

For more information about WYG Engineering, please have a look at our [brochure](#)

WYG

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Appendix E - Greenfield Runoff Calculations

Calculated by: Francisco Aguilar

Site name: Harras Moor

Site location:

Site coordinates

Latitude: 54.54836° N

Longitude: 3.56856° W

This is an estimation of the greenfield runoff rate limits that are needed to meet normal best practice criteria in line with Environment Agency guidance "Preliminary rainfall runoff management for developments", W5-074/A/TR1/1 rev. E (2012) and the SuDS Manual, C753 (Ciria, 2015). This information on greenfield runoff rates may be the basis for setting consents for the drainage of surface water runoff from sites.

Reference: 6323521

Date: 2018-03-14T10:52:10

Methodology

IH124

Site characteristics

Total site area (ha) 15.1

Methodology

Qbar estimation method Calculate from SPR and SAAR

SPR estimation method Calculate from SOIL type

	Default	Edited
SOIL type	4	4
HOST class	---	---
SPR/SPRHOST	0.47	0.47

Hydrological characteristics

	Default	Edited
SAAR (mm)	1131	1131
Hydrological region	10	10
Growth curve factor: 1 year	0.87	0.87
Growth curve factor: 30 year	1.7	1.7
Growth curve factor: 100 year	2.08	2.08

Notes:

(1) Is $Q_{BAR} < 2.0$ l/s/ha?
(2) Are flow rates < 5.0 l/s?
(3) Is $SPR/SPRHOST \leq 0.3$?

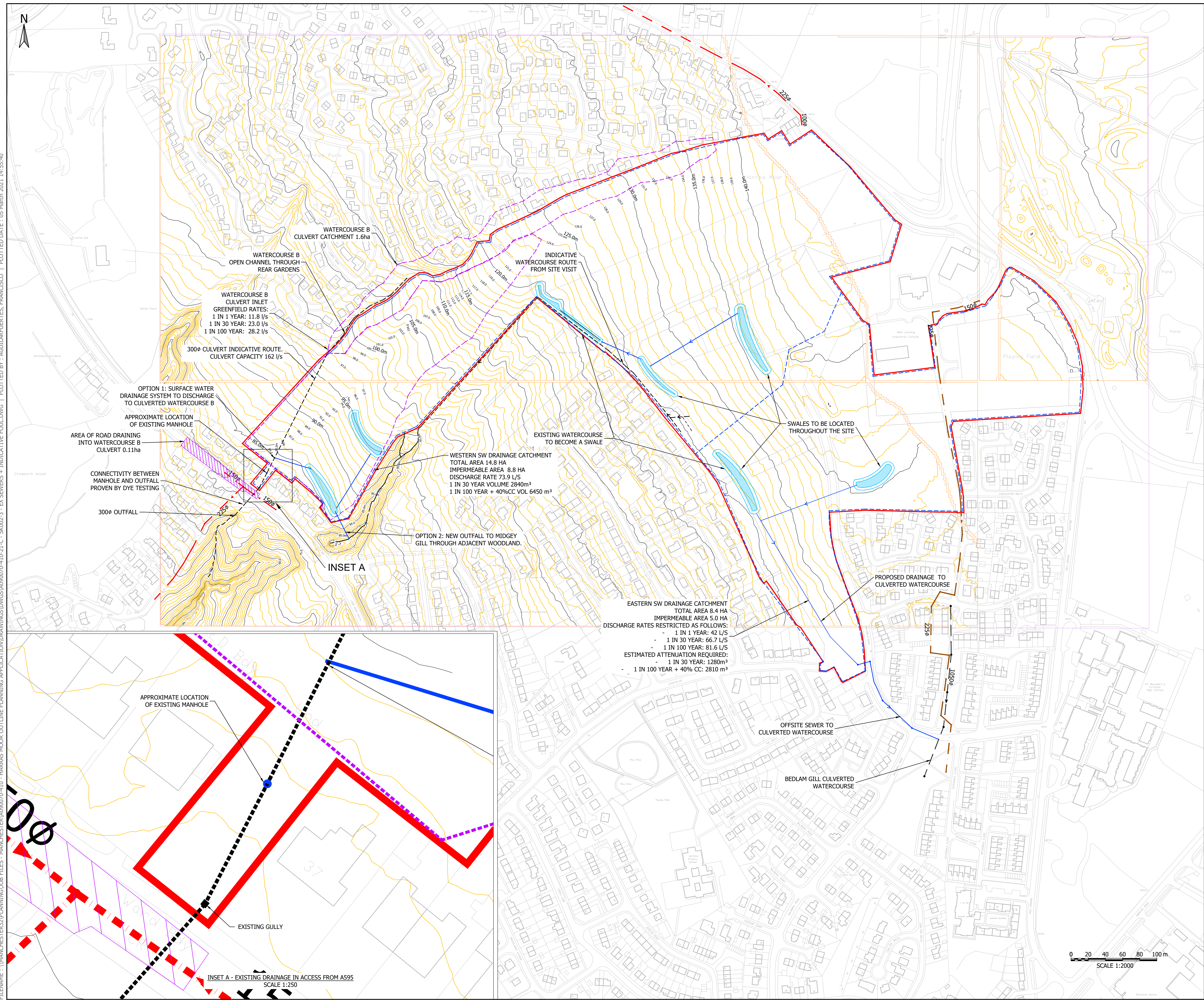
Greenfield runoff rates

	Default	Edited
Qbar (l/s)	127.8	127.8
1 in 1 year (l/s)	111.18	111.18
1 in 30 years (l/s)	217.25	217.25
1 in 100 years (l/s)	265.82	265.82



Appendix F - Preliminary Surface Water Drainage Layout

FILENAME: \\MANCHESTER32\PLANNING\JOB FILES - MANCHESTER\A090070\410 - HARRAS MOOR OUTLINE PLANNING APPLICATION\DRAWINGS\DWGS\A090070-410-21-C - SK002-3 - EX SEWERS + INDICATIVE FOUL DNG | PLOTTED DATE: 05 March 2021 14:55:40



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2. ALL LEVELS IN METRES ABOVE ORDNANCE DATUM.
3. SEWER RECORDS PROVIDED BY UNITED UTILITIES.
4. LIDAR CONTOURS OBTAINED UNDER OPEN GOVERNMENT LICENCE.

KEY

- SITE BOUNDARY
- SURFACE WATER SUB - CATCHMENT
- EXISTING WATERCOURSE
- PROPOSED SURFACE WATER DRAINAGE
- WATERCOURSE CATCHMENT BOUNDARY

P5	REVISED SURFACE WATER DRAINAGE	FA			22.02.2021
P4	INSET A ADDED	FA			08.02.2021
P3	REVISED FOLLOWING DRAINAGE INVESTIGATIONS	FA	ME	ME	16.12.20
P2	FIRST ISSUE	FA	TB	TB	
REV	DESCRIPTION	BY	CHK	APP	DATE

PRELIMINARY ISSUE

3 SOVEREIGN SQUARE
SOVEREIGN STREET
LEEDS
LS1 4ER

TEL: +44 (0)113 278 7111
FAX: +44 (0)113 278 3487
e-mail: leeds@wyg.com



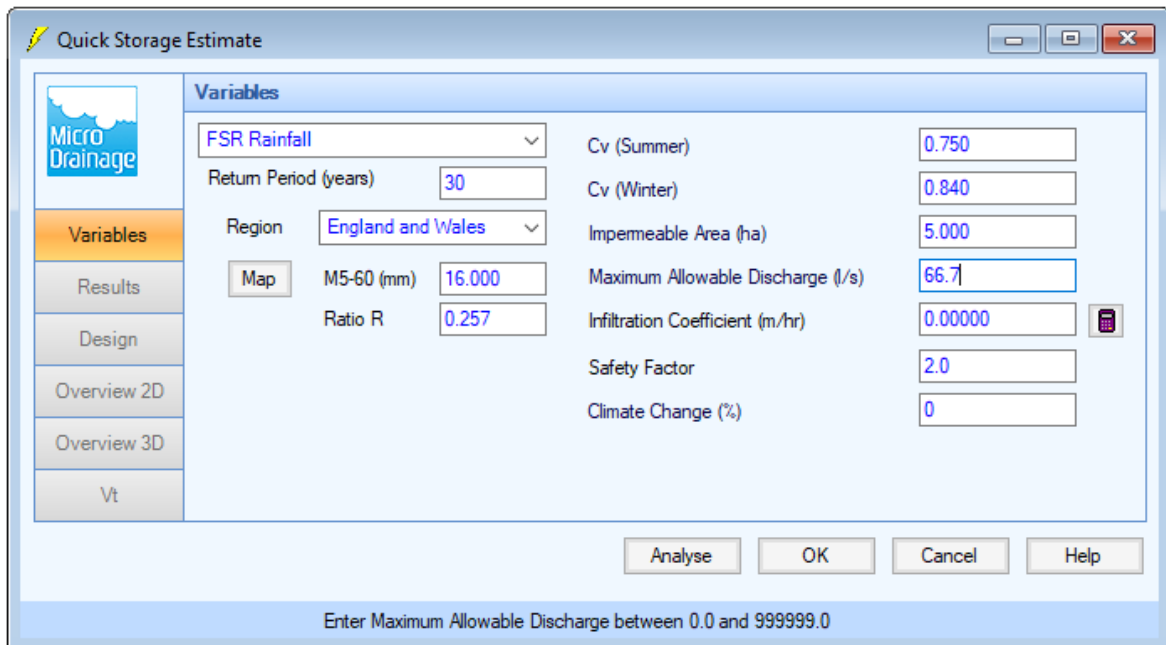
Project:
HARRAS MOOR, WHITEHAVEN

Drawing Title:
INDICATIVE SURFACE WATER DRAINAGE
1m LIDAR CONTOURS

Scale @	A1	Drawn	Date	Checked	Date	Approved	Date
AS SHOWN	FA	NOV 17	TB	NOV 17	TB	NOV 17	
Project No.	Office	Type	Drawing No.	Revision			
A090070-410	21	C	SK003	P5			

Appendix G - Quick Storage Estimates

Eastern Catchment



Quick Storage Estimate

Micro Drainage

Variables

FSR Rainfall

Return Period (years) 30

Region England and Wales

Map

M5-60 (mm) 16.000

Ratio R 0.257

Cv (Summer) 0.750

Cv (Winter) 0.840

Impervious Area (ha) 5.000

Maximum Allowable Discharge (l/s) 66.7

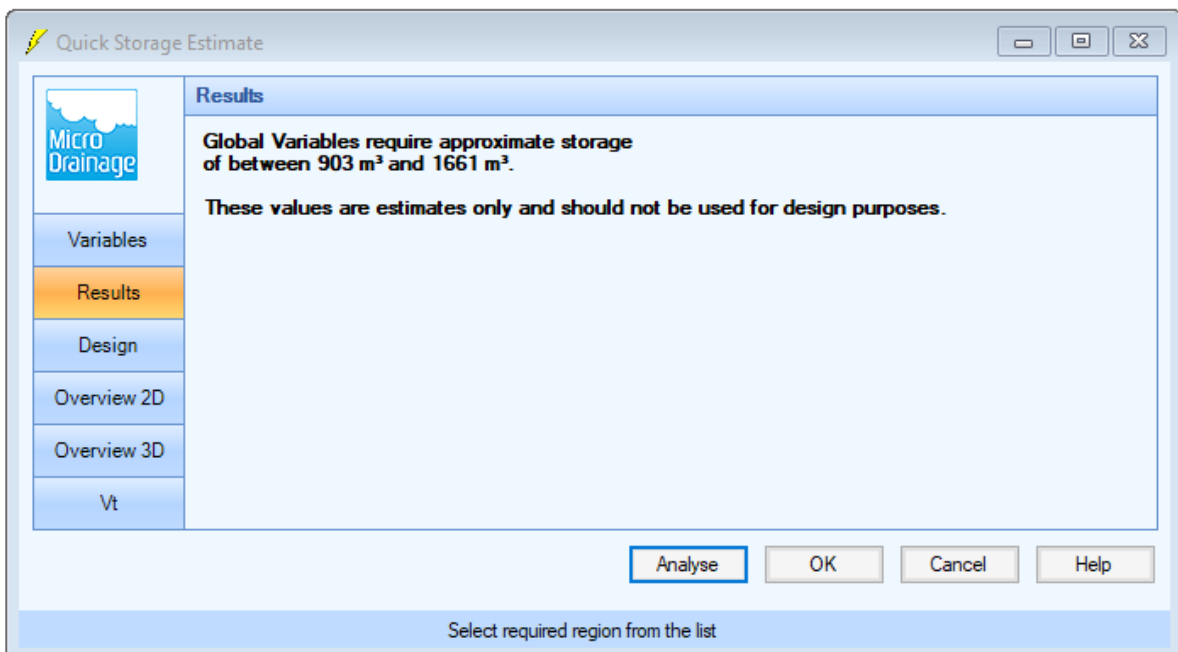
Infiltration Coefficient (m/hr) 0.00000

Safety Factor 2.0

Climate Change (%) 0

Analyse OK Cancel Help

Enter Maximum Allowable Discharge between 0.0 and 999999.0



Quick Storage Estimate

Micro Drainage

Results

Global Variables require approximate storage of between 903 m³ and 1661 m³.

These values are estimates only and should not be used for design purposes.

Analyse OK Cancel Help

Select required region from the list

Quick Storage Estimate

Micro Drainage

Variables

FSR Rainfall

Return Period (years)

Region

Map

Ratio R

Cv (Summer)

Cv (Winter)

Impermeable Area (ha)

Maximum Allowable Discharge (l/s)

Infiltration Coefficient (m/hr)

Safety Factor

Climate Change (%)

Analyse OK Cancel Help

Enter Climate Change between -100 and 600

Quick Storage Estimate

Micro Drainage

Results

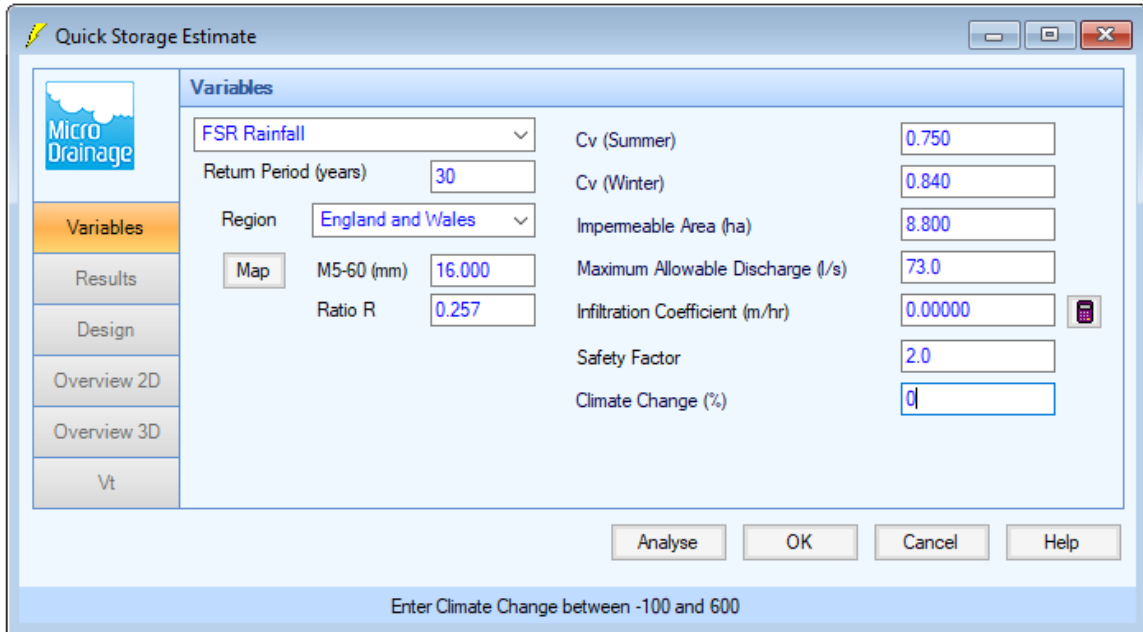
Global Variables require approximate storage of between 2060 m³ and 3485 m³.

These values are estimates only and should not be used for design purposes.

Analyse OK Cancel Help

Enter Climate Change between -100 and 600

Western Catchment



Quick Storage Estimate

Variables

FSR Rainfall

Return Period (years) 30

Region England and Wales

Map M5-60 (mm) 16.000

Ratio R 0.257

Cv (Summer) 0.750

Cv (Winter) 0.840

Impervious Area (ha) 8.800

Maximum Allowable Discharge (l/s) 73.0

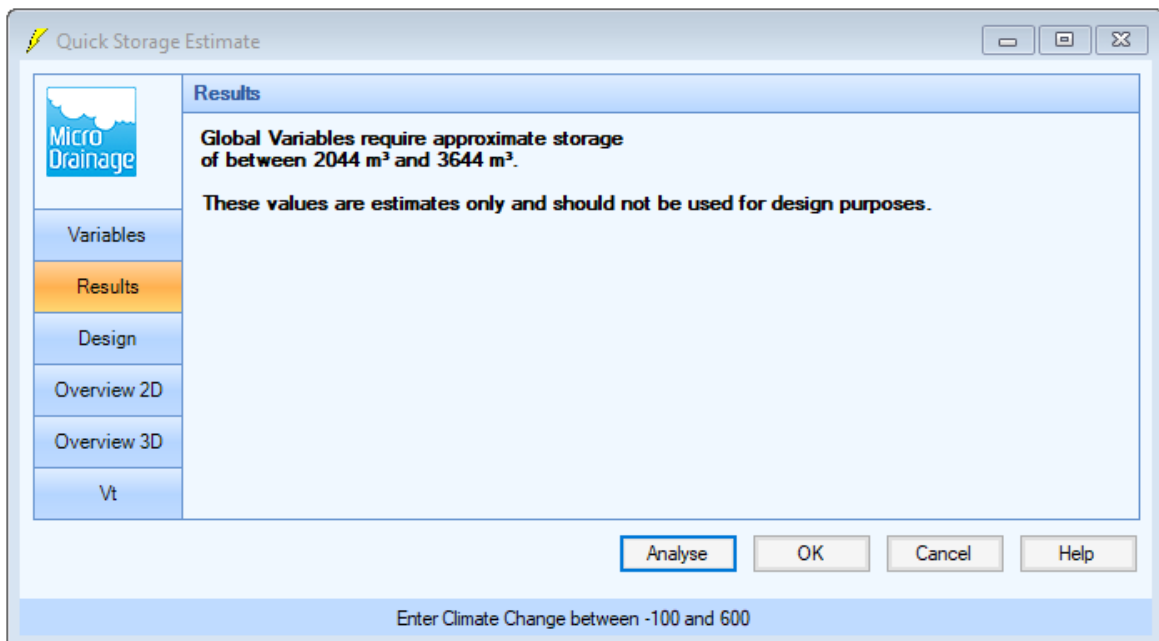
Infiltration Coefficient (m/hr) 0.00000

Safety Factor 2.0

Climate Change (%) 0

Analyse OK Cancel Help

Enter Climate Change between -100 and 600



Quick Storage Estimate

Results

Global Variables require approximate storage of between 2044 m³ and 3644 m³.

These values are estimates only and should not be used for design purposes.

Analyse OK Cancel Help

Enter Climate Change between -100 and 600

Quick Storage Estimate

Micro Drainage

Variables

FSR Rainfall

Return Period (years)

Region

Map

Ratio R

Cv (Summer)

Cv (Winter)

Impermeable Area (ha)

Maximum Allowable Discharge (l/s)

Infiltration Coefficient (m/hr)

Safety Factor

Climate Change (%)

Analyse OK Cancel Help

Enter Area between 0.000 and 999.999

Quick Storage Estimate

Micro Drainage

Results

Global Variables require approximate storage of between 4913 m³ and 7976 m³.

These values are estimates only and should not be used for design purposes.

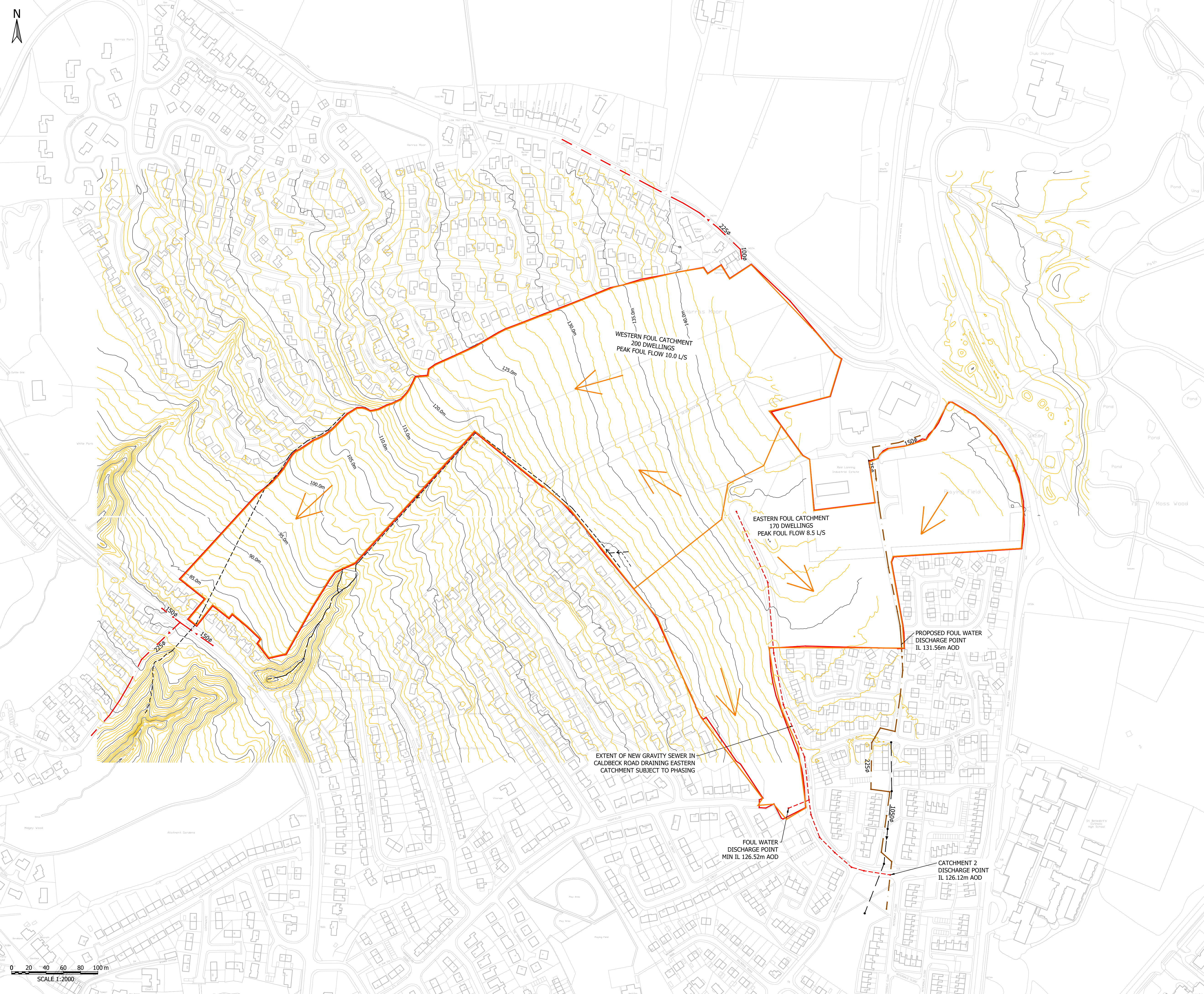
Analyse OK Cancel Help

Enter Area between 0.000 and 999.999



Appendix H - Foul Drainage Catchment Plan

FILENAME: \\MANCHESTER32\PLANNING\JOB FILES - MANCHESTER\A090070-410 - HARRAS MOOR OUTLINE PLANNING APPLICATION\DRAWINGS\DWGS\A090070-410-21-C - SK002-3 - EX SERVERS + INDICATIVE FOUL DWG | PLOTTED BY: AGUILARBUERTES, FRANCISCO | PLOTTED DATE: 17 March 2021 12:06:00



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3. ALL LEVELS IN METRES AOD.
4. LIDAR DATA OBTAINED UNDER OPEN GOVERNMENT LICENCE.
5. FOUL CATCHMENTS INDICATIVE ONLY AND SUBJECT TO FINAL SITE PHASING

KEY

- SITE BOUNDARY
- FOUL WATER DRAINAGE CATCHMENT BOUNDARY
- EXISTING UU FOUL SEWER
- EXISTING UU COMBINED SEWER
- EXISTING CULVERTED WATERCOURSE
- PROPOSED FOUL SEWER

THIS DRAWING IS FOR OUTLINE PLANNING PURPOSES ONLY AND SUBJECT TO FURTHER DETAILED DESIGN

P5	REVISED FOUL CATCHMENTS	FA			17.03.2020
P4	REVISED FOUL CATCHMENTS	FA			15.03.2021
P3	REVISED FOR ISSUE	FA			05.03.21
P2	REVISED NUMBER OF DWELLINGS	FA	TB	TB	14.03.18
P1	PRELIMINARY ISSUE	FA	TB	TB	
REV	DESCRIPTION	BY	CHK	APP	DATE

FOR INFORMATION ONLY

3 SOVEREIGN SQUARE
SOVEREIGN STREET
LEEDS
LS1 4ER

TEL: +44 (0)113 278 7111
FAX: +44 (0)113 278 3487
e-mail: leeds@wyg.com



Project:
HARRAS MOOR, WHITEHAVEN

Drawing Title:
PROPOSED FOUL DRAINAGE STRATEGY
1m LIDAR CONTOURS

Scale @	A1	Drawn	Date	Checked	Date	Approved	Date
1:2000		FA	NOV 17	TB	NOV 17	TB	NOV 17
Project No.	A090070-410	Office	21	Type	C	Drawing No.	SK002
						Revision	P5



Appendix I - United Utilities Pre Development Enquiry

From: Wong , Josephine <Josephine.Wong@uuplc.co.uk>
Sent: 20 December 2017 09:05
To: francisco.aguilar
Cc: Wastewater Developer Services
Subject: FW: 450 dwellings at Harras Moor, Whitehaven, CA28 6SY (Grid 298631, 518123) - UU reference: 4200018839
Attachments: A090070-410-21-C-SK002-INDICATIVE FOUL DRAINAGE.pdf

Dear Francisco

450 dwellings at Harras Moor, Whitehaven, CA28 6SY (Grid 298631, 518123)
UU reference: 4200018839

We have carried out an assessment of your application which is based on the information provided; this pre development advice will be valid for 12 months.

Foul water

Following the modelling assessment, the foul drainage proposal showing the attached drawing "Existing Sewers 1m Lidar Contours, ref: SK002 Revision P1, dated November 2017", is acceptable to us in principle.

Surface Water

Surface water from this site should drain to either soak away or directly to watercourse. Discharge rates and consents must be discussed and agreed with all interested parties. Under no circumstance should surface water discharge into public sewer directly or indirectly.

Existing Sewers Crossing the Site

A public sewer crosses this site and we may not permit building over it. We will require an access strip width of six metres, three metres either side of the centre line of the sewer which is in accordance with the minimum distances specified in the current issue of "Sewers for Adoption", for maintenance or replacement. Therefore a modification of the site layout, or a diversion of the affected public sewer at the applicant's expense, may be necessary. To establish if a sewer diversion is feasible, the applicant must discuss this at an early stage with our Developer Engineer at wastewaterdeveloperservices@uuplc.co.uk as a lengthy lead in period may be required if a sewer diversion proves to be acceptable. Deep rooted shrubs and trees should not be planted in the vicinity of the public sewer and overflow systems.

Connection Application

Although we may discuss and agree discharge points & rates in principle, please be aware that you will have to apply for a formal sewer connection. This is so that we can assess the method of construction, Health & Safety requirements and to ultimately inspect the connection when it is made. Details of the application process and the form itself can be obtained from our website by following the link below <http://www.unitedutilities.com/connecting-public-sewer.aspx>

Sewer Adoption Agreement

You may wish to offer the proposed new sewers for adoption. United Utilities assess adoption application based on Sewers adoption 6th Edition and for any pumping stations our company addenda document. Please refer to link below to obtain further guidance and application pack:
<http://www.unitedutilities.com/sewer-adoption.aspx>

Water Supply Enquiry

If you have any query about water supply, please contact the water supply team at developerserviceswater@uuplc.co.uk

Please be aware that on site drainage must be designed in accordance with Building Regulations, National Planning Policy, Planning Conditions and local flood authority guidelines, we would recommend that you liaise and make suitable agreements with the relevant statutory bodies.

Should you have any query, please feel free to contact me.

Many thanks.

Regards,

Josephine Wong

Wastewater Development Engineer
Developer Services and Planning Team
Operational Services
United Utilities
T: 01925 679 406 (internal 79406)
Email: josephine.wong@uuplc.co.uk
unitedutilities.com

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From: Wong , Josephine
Sent: 22 November 2017 11:02
To: 'francisco.aguilar@wyg.com' <francisco.aguilar@wyg.com>
Subject: FW: 450 dwellings at Harras Moor, Whitehaven, CA28 6SY (Grid 298631, 518123) - UU reference: 4200018839

Hi, Francisco

I have forwarded the indicative foul drainage to our modelling team for modelling exercise.

We will contact you again once the modelling exercise is complete.

Should you have any query, please feel free to contact me.

Many thanks.

Regards,

Josephine Wong

Wastewater Development Engineer
Developer Services and Planning Team
Operational Services
United Utilities
T: 01925 679 406 (internal 79406)
Email: josephine.wong@uuplc.co.uk
unitedutilities.com

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From: francisco.aguilar [<mailto:francisco.aguilar@wyg.com>]
Sent: 22 November 2017 07:54
To: Wong , Josephine <Josephine.Wong@uuplc.co.uk>

Cc: Wastewater Developer Services <WastewaterDeveloperServices@uuplc.co.uk>; tom.beavis <tom.beavis@wyg.com>

Subject: RE: 450 dwellings at Harras Moor, Whitehaven, CA28 6SY (Grid 298631, 518123) - UU reference: 4200018839

Hi Josephine,

The attached drawing shows the site boundary and the site divided in 3 foul drainage catchments, showing the number of dwellings in catchment and the proposed peak foul flow.

You can see that it is proposed to discharge foul flows from approximately 315 houses to the 225mm sewer in Sandhurst Drive (in two separate connections); and the additional 135 houses to the sewer in the A595.

At this moment an indicative masterplan has not yet been produced.

We do not know a buildout rate either but I would expect it to be between 50 and 100 dwellings per year in 2 or 3 phases.

Hopefully this will give you enough information to progress the enquiry, if you have any further queries, let me know.

Thank you for your help

Regards

Francisco Aguilar
Flood Risk & Drainage Engineer

For more information about WYG Engineering, please have a look at our [brochure](#)

WYG

Arndale Court, Headingley, Leeds, West Yorkshire, LS6 2UJ

Tel: +44 113 219 2284

www.wyg.com

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Registered Office: Arndale Court, Otley Road, Headingley, Leeds, West Yorkshire LS6 2UJ VAT No: 431-0326-08.



From: Wong , Josephine [<mailto:Josephine.Wong@uuplc.co.uk>]

Sent: 21 November 2017 11:33

To: francisco.aguilar <francisco.aguilar@wyg.com>

Cc: Wastewater Developer Services <WastewaterDeveloperServices@uuplc.co.uk>

Subject: 450 dwellings at Harras Moor, Whitehaven, CA28 6SY (Grid 298631, 518123) - UU reference: 4200018839

Importance: High

Dear Francisco

450 dwellings at Harras Moor, Whitehaven, CA28 6SY (Grid 298631, 518123)

UU reference: 4200018839

Due to complexity of the site, please send us the following information for our assessment/ modelling exercise.

1. A proposed site layout plan
2. A phasing plan
3. A build out rate, expected start date on site and anticipated completion date
4. A high level proposed drainage layout plan showing surface water and foul water connection points and their discharge rates

Should you have any query, please feel free to contact me.

Many thanks.

Regards,

Josephine Wong

Wastewater Development Engineer
Developer Services and Planning Team
Operational Services
United Utilities
T: 01925 679 406 (internal 79406)
Email: josephine.wong@uuplc.co.uk
unitedutilities.com

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From: francisco.aguilar [<mailto:francisco.aguilar@wyg.com>]

Sent: 07 November 2017 12:05

To: Wastewater Developer Services <WastewaterDeveloperServices@uuplc.co.uk>

Cc: tom.beavis <tom.beavis@wyg.com>

Subject: Pre Development Enquiry - Harras Moor, Whitehaven

Hi,

Please find attached a new pre – development enquiry regarding a new proposed development of up to 450 dwellings in Harras Moor, Whitehaven. A plan showing the site boundary is attached for convenience.

Surface water runoff will be discharged to adjacent watercourses.

Foul water flows from the 450 dwellings will be discharged to the UU sewer network and we seek your views on the preferred discharge points.

Thank you for your help

Regards

Francisco Aguilar

Flood Risk & Drainage Engineer

For more information about WYG Engineering, please have a look at our [brochure](#)

WYG

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Tel: +44 113 219 2284

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Registered Office: Arndale Court, Otley Road, Headingley, Leeds, West Yorkshire LS6 2UJ VAT No: 431-0326-08.



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EMGateway3.uuplc.co.uk made the following annotations

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Appendix J - Typical SuDS Details



1 Typical Swale Details



Photo showing possible use of swales to discharge housing run off



Photo showing typical swale located adjacent to highway

Diagram illustrating a typical stormwater management pond cross-section. The pond features a rounded bottom for mowing, a gently sloping side with a 1 to 2 ratio, and a flat bottom to encourage sheet flow of runoff. The pond is designed for 100-year treatment depth and 100-year storage depth. The outlet is labeled 'Stormwater Outlet' and the inlet is labeled 'Stormwater Inlet'. The grass topsoil layer is labeled 'Grass Topsoil (100-year)'. A scale bar at the bottom right indicates 0 to 20 feet.

The diagram illustrates a cross-section of a road pavement structure. Key components labeled include:

- Top Layer:** A green layer representing the top surface or vegetation.
- Subgrade:** The base layer beneath the pavement.
- Pavement Layers:** Multiple layers of different materials (hatched patterns) forming the road surface.
- Drainage:** A system on the right side showing water flowing from the surface into a drainage ditch.
- Foundation:** The base upon which the pavement is constructed.
- Labels:** Various labels with arrows pointing to specific parts of the structure, including 'Subgrade', 'Pavement', 'Foundation', 'Drainage', and 'Top Layer'.

creative minds safe hands

2 Typical Filter Strip Details



Photo showing edge of carriageway filter strip

3 Typical Edge of Carriageway Details



Photo showing edge of carriageway detail

Diagram illustrating the flow of shear stress in a composite beam. The beam consists of a concrete slab (1.5m x 1.5m) and a steel beam (1.5m x 1.5m). The shear stress flows from the concrete slab into the steel beam, as indicated by the arrows. A note at the bottom right states: "by transverse shear stress".

4

A photograph showing a wide, grassy field in the foreground. In the background, there is a paved road, a white fence, and several buildings, including a large dark building with a red roof. A tall, thin tower is visible in the distance under a cloudy sky.

Appendix K - Bedlam Gill Catchment Analysis

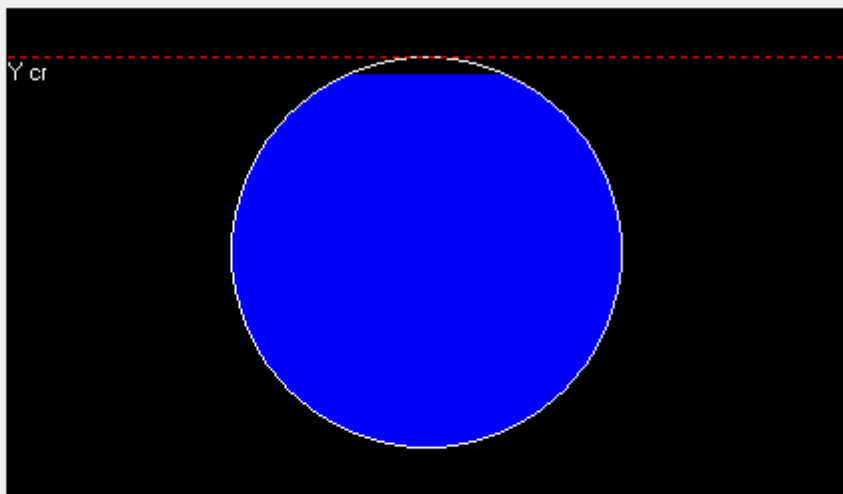
OpenChan v1.0 Uniform Flow

Geometry
 Shape: **Circular**
 Diameter (m): **1.05**
 Length (m): **30**
 Fall (m): **1**

Basic data
 Kin. Visc: **1.14e-6** m²/s
 Gravity, g: **9.81** m/s²

Use flow equation
☒ Colebrook k: **1.50**
☒ **Manning n**: **0.015**
☐ Hazen Will, C: **110**

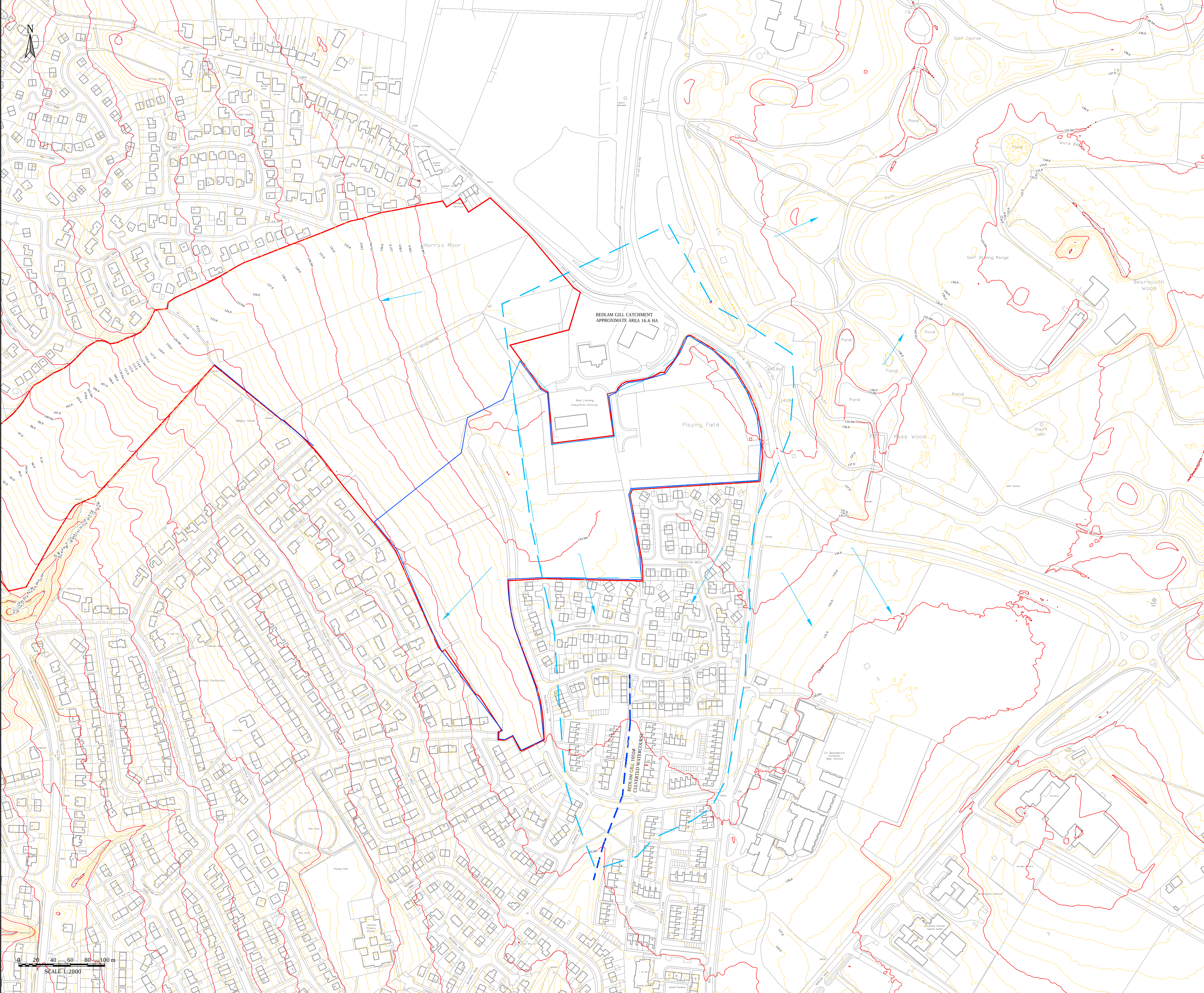
Single calc | Function



Calculation
 Flow rate (m³/s): **4.640** <- Calc Q Calc Y -> Depth (m): **1.0**

Results

V (m/s)	5.45390	Flow area (m ²)	0.85085
Energy (m)	146.899	Hyd radius (m)	0.300
Crit depth, y _c	1.050	Top width (m)	



DO NOT SCALE: CONTRACTOR TO CHECK ALL DIMENSIONS AND REPORT ANY OMISSIONS OR ERRORS

NOTES

- 1. ALL LEVELS IN METRES AOD
- 2. CULVERTED WATERCOURSE ALIGNMENT TAKEN FROM UNITED UTILITIES SEWER RECORDS
- 3. LIDAR DATA OBTAINED UNDER OPEN GOVERNMENT LICENCE

KEY

- SITE BOUNDARY
- APPROXIMATE CATCHMENT BOUNDARY
- INDICATIVE SURFACE WATER FLOW DIRECTIONS
- PROPOSED DRAINAGE CATCHMENT INTO BEDLAM GILL

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FOR INFORMATION ONLY

P1	PRELIMINARY ISSUE	OC	FA	TB	10.10.18
REV	DESCRIPTION	BY	CHK	APP	DATE

ARNDAL COURT
HEADINGLEY
LEEDS
LS6 2UJ

TEL: +44 (0)113 278 7111
FAX: +44 (0)113 278 3487
e-mail: leeds@wyg.com

Project:
**HARRAS MOOR
WHITEHAVEN**

Drawing Title:
CULVERTED WATERCOURSE CATCHMENT

Scale @ 1:2000	A1	Drawn OC	Date OCT 18	Checked FA	Date OCT 18	Approved TB	Date OCT 18
Project No. A090070-410	Office 21	Type C	Drawing No. SK007	Revision P1			



Calculated by: Francisco Aguilar

Site name: Bedlam Gill catchment

Site location:

Site coordinates

Latitude: 54.54739° N

Longitude: 3.56286° W

This is an estimation of the greenfield runoff rate limits that are needed to meet normal best practice criteria in line with Environment Agency guidance "Preliminary rainfall runoff management for developments", W5-074/A/TR1/1 rev. E (2012) and the SuDS Manual, C753 (Ciria, 2015). This information on greenfield runoff rates may be the basis for setting consents for the drainage of surface water runoff from sites.

Reference: 6442653

Date: 2018-10-09T10:25:19

Methodology

IH124

Site characteristics

Total site area (ha)	4.4
----------------------	-----

Methodology

Qbar estimation method	Calculate from SPR and SAAR
SPR estimation method	Calculate from SOIL type

	Default	Edited
SOIL type	4	4
HOST class	---	---
SPR/SPRHOST	0.47	0.47

Hydrological characteristics

	Default	Edited
SAAR (mm)	1183	1183
Hydrological region	10	10
Growth curve factor: 1 year	0.87	0.87
Growth curve factor: 30 year	1.7	1.7
Growth curve factor: 100 year	2.08	2.08

Notes:

(1) Is $Q_{BAR} < 2.0$ l/s/ha?

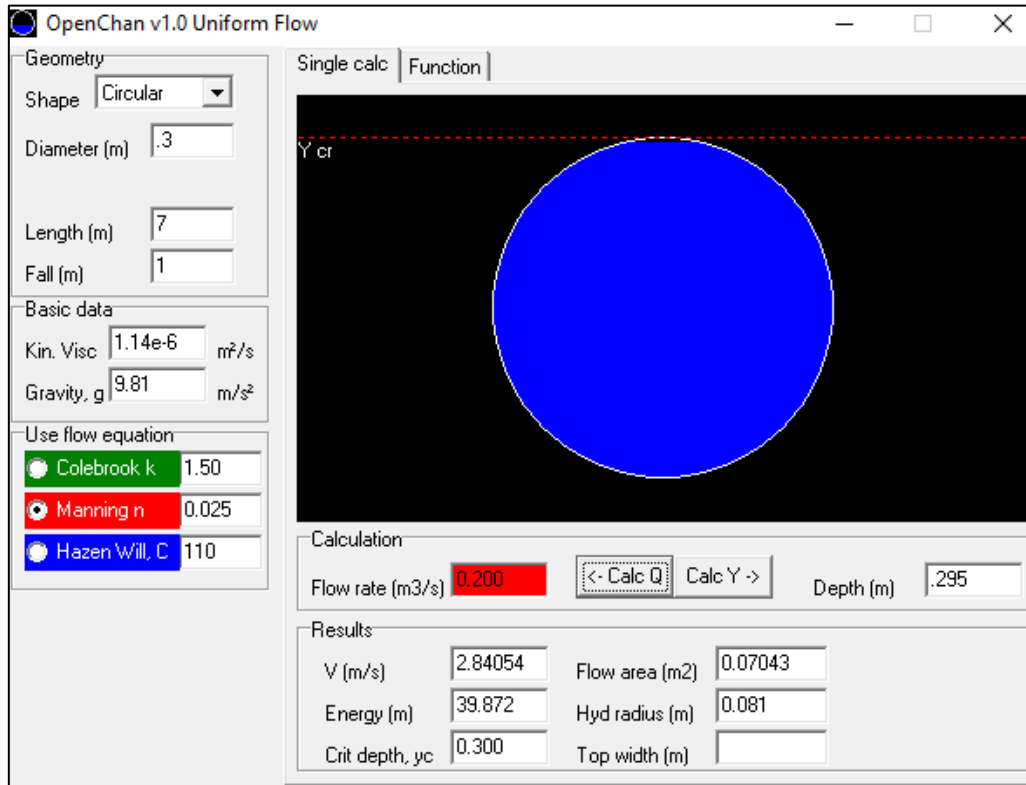
(2) Are flow rates < 5.0 l/s?

(3) Is $SPR/SPRHOST \leq 0.3$?

Greenfield runoff rates

	Default	Edited
Qbar (l/s)	39.25	39.25
1 in 1 year (l/s)	34.15	34.15
1 in 30 years (l/s)	66.72	66.72
1 in 100 years (l/s)	81.64	81.64

Appendix L - Watercourse B Catchment Analysis



OpenChan v1.0 Uniform Flow

Geometry
Shape: **Circular**
Diameter (m): **0.3**
Length (m): **7**
Fall (m): **1**

Basic data
Kin. Visc: **1.14e-6** m²/s
Gravity, g: **9.81** m/s²

Use flow equation
☒ Colebrook k: **1.50**
☒ Manning n: **0.025**
☐ Hazen Will. C: **110**

Single calc | Function

Y cr

Calculation
Flow rate (m³/s): **0.200** | **< Calc Q** | **Calc Y >** | Depth (m): **0.295**

Results
V (m/s): **2.84054** | Flow area (m²): **0.07043**
Energy (m): **39.872** | Hyd radius (m): **0.081**
Crit depth, y_c: **0.300** | Top width (m):

Calculated by:	Francisco Aguilar
Site name:	watercourse B
Site location:	

This is an estimation of the greenfield runoff rates that are used to meet normal best practice criteria in line with Environment Agency guidance "Rainfall runoff management for developments", SC030219 (2013), the SuDS Manual C753 (Ciria, 2015) and the non-statutory standards for SuDS (Defra, 2015). This information on greenfield runoff rates may be the basis for setting consents for the drainage of surface water runoff from sites.

Site Details

Latitude:	54.54815° N
Longitude:	3.57217° W
Reference:	2457729833
Date:	Dec 15 2020 10:33

Runoff estimation approach

IH124

Site characteristics

Total site area (ha):	1.6
-----------------------	-----

Methodology

Q _{BAR} estimation method:	Calculate from SPR and SAAR
SPR estimation method:	Calculate from SOIL type

Soil characteristics

	Default	Edited
SOIL type:	4	4
HOST class:	N/A	N/A
SPR/SPRHOST:	0.47	0.47

Hydrological characteristics

	Default	Edited
SAAR (mm):	1131	1131
Hydrological region:	10	10
Growth curve factor 1 year:	0.87	0.87
Growth curve factor 30 years:	1.7	1.7
Growth curve factor 100 years:	2.08	2.08
Growth curve factor 200 years:	2.37	2.37

Notes

(1) Is $Q_{\text{BAR}} < 2.0$ l/s/ha?

When Q_{BAR} is < 2.0 l/s/ha then limiting discharge rates are set at 2.0 l/s/ha.

(2) Are flow rates < 5.0 l/s?

Where flow rates are less than 5.0 l/s consent for discharge is usually set at 5.0 l/s if blockage from vegetation and other materials is possible. Lower consent flow rates may be set where the blockage risk is addressed by using appropriate drainage elements.

(3) Is $\text{SPR/SPRHOST} \leq 0.3$?

Where groundwater levels are low enough the use of soakaways to avoid discharge offsite would normally be preferred for disposal of surface water runoff.

Greenfield runoff rates

	Default	Edited
Q _{BAR} (l/s):	13.54	13.54
1 in 1 year (l/s):	11.78	11.78
1 in 30 years (l/s):	23.02	23.02
1 in 100 year (l/s):	28.17	28.17
1 in 200 years (l/s):	32.09	32.09

This report was produced using the greenfield runoff tool developed by HR Wallingford and available at www.uksuds.com. The use of this tool is subject to the UK SuDS terms and conditions and licence agreement, which can both be found at www.uksuds.com/terms-and-conditions.htm. The outputs from this tool are estimates of greenfield runoff rates. The use of these results is the responsibility of the users of this tool. No liability will be accepted by HR Wallingford, the Environment Agency, CEH, Hydrosolutions or any other organisation for the use of this data in the design or operational characteristics of any drainage scheme.

Calculated by:	Francisco Aguilar
Site name:	harras moor land drain
Site location:	

This is an estimation of the greenfield runoff rates that are used to meet normal best practice criteria in line with Environment Agency guidance "Rainfall runoff management for developments", SC030219 (2013), the SuDS Manual C753 (Ciria, 2015) and the non-statutory standards for SuDS (Defra, 2015). This information on greenfield runoff rates may be the basis for setting consents for the drainage of surface water runoff from sites.

Site Details

Latitude:	54.54616° N
Longitude:	3.57504° W
Reference:	757678262
Date:	Nov 06 2020 12:23

Runoff estimation approach

IH124

Site characteristics

Total site area (ha):	3.48
-----------------------	------

Methodology

Q _{BAR} estimation method:	Calculate from SPR and SAAR
SPR estimation method:	Calculate from SOIL type

Soil characteristics

	Default	Edited
SOIL type:	4	4
HOST class:	N/A	N/A
SPR/SPRHOST:	0.47	0.47

Hydrological characteristics

	Default	Edited
SAAR (mm):	1140	1140
Hydrological region:	10	10
Growth curve factor 1 year:	0.87	0.87
Growth curve factor 30 years:	1.7	1.7
Growth curve factor 100 years:	2.08	2.08
Growth curve factor 200 years:	2.37	2.37

Notes

(1) Is $Q_{\text{BAR}} < 2.0$ l/s/ha?

When Q_{BAR} is < 2.0 l/s/ha then limiting discharge rates are set at 2.0 l/s/ha.

(2) Are flow rates < 5.0 l/s?

Where flow rates are less than 5.0 l/s consent for discharge is usually set at 5.0 l/s if blockage from vegetation and other materials is possible. Lower consent flow rates may be set where the blockage risk is addressed by using appropriate drainage elements.

(3) Is $\text{SPR/SPRHOST} \leq 0.3$?

Where groundwater levels are low enough the use of soakaways to avoid discharge offsite would normally be preferred for disposal of surface water runoff.

Greenfield runoff rates

	Default	Edited
Q _{BAR} (l/s):	29.73	29.73
1 in 1 year (l/s):	25.86	25.86
1 in 30 years (l/s):	50.54	50.54
1 in 100 year (l/s):	61.83	61.83
1 in 200 years (l/s):	70.45	70.45

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